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The marine-based NW Fennoscandian Ice Sheet: glacial and deglacial dynamics as reconstructed from submarine landforms

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In this study, the configuration of the marine-based NW Fennoscandian ice sheet during the last glacial maximum (LGM) and deglaciation were reconstructed using detailed swath bathymetry and high-resolution seismic data. The investigated area covers about 10,000 km^2 of the continental shelf outside Troms, northern Norway, where the large scale morphology is characterized by cross-shelf and coast-parallel troughs, and banks. The glacial landforms preserved on the seabed were mapped, and their spatial distribution discussed. Mega-scale glacial lineations, flutes and crag-and-tails were mainly found in the cross-shelf troughs. These are in some areas overprinted by larger end moraines and grounding zone wedges (GZW). At the trough-bank borders, lateral moraines, as well as shear zone moraines, were found, whereas a high density of smaller end moraines occurred on the banks. Iceberg plough marks and dead-ice terrain were observed both in the cross-shelf troughs and on the banks. From the mapped landforms the extent and dynamics of the ice sheet during the LGM were deduced. Fast-flowing ice streams are inferred in the cross-shelf troughs, while only end moraines on the banks indicate more sluggish ice here. The marine-based part of the Fennoscandian ice sheet was drained via fjord and valley systems inshore, fed from the major ice dome in the east. We estimate the palaeo-ice stream velocities during LGM to be between 260 and 330 m/year. Three deglaciation events have been reconstructed: i) During the Torsken-1 event the marine-based ice in the troughs retreated rapidly from the shelf break, halted or readvanced to form GZWs and the Torsken moraine, ii) Several halts or readvances characterized the ice recession on the shallower banks during the Torsken-2 event, and iii) In the Flesen event most of the troughs and banks were deglaciated. However, prominent end moraines in the inner parts of the troughs and banks indicate halts of the ice also during this event.